4.3.3.2.1.4 *Water Resources*

The construction and operation of a ceramic immobilization facility would affect water resources. Water resource requirements, and discharges provided in Tables C.1.1.3–3 and C.2.1.3–3 and Table E.3.3.3–1, were used to assess impacts to surface water and groundwater. The discussion of impacts is provided for each site separately. Table 4.3.3.2.1.4–1 presents No Action surface and groundwater uses and discharges at each site, and the potential changes to water resources resulting from construction and operation of the ceramic immobilization facility.

Hanford Site

Surface Water. Surface water would be used as the water source for construction and operation of the ceramic immobilization facility, and would be obtained from the Columbia River. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr), which would represent less than a 0.3-percent increase over the existing annual surface water withdrawal. These additional withdrawals would cause negligible impact to surface water availability.

During operation, water requirements for the ceramic immobilization facility would be approximately 320 million l/yr (84.5 million gal/yr), which would represent a 2.4-percent increase over the existing surface water withdrawal.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to percolation ponds at the 200 East Area. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would also be discharged to percolation ponds. All discharges would be monitored. Percolation of this treated wastewater into the unconfined aquifer could contribute to the rising, or mounding, of the water table at the 200 Areas. However, no other impacts to the aquifer would be expected.

Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. The wastewater would be monitored for radioactivity, and if uncontaminated, discharged to percolation ponds or storm drains that discharge to local drainage channels. Impacts to the unconfined aquifer would be the same as discussed above.

The ceramic immobilization facility would be located in the 200 Area which is above the 100-year, 500-year and probable maximum flood boundaries; flooding from dam failures; and flooding from a landslide resulting in river blockage.

Groundwater. No groundwater would be used for any project-related water requirements; therefore groundwater availability would not be affected. Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater which does not evaporate, however, could percolate downward toward the groundwater of the unconfined aquifer. This water would be monitored and would not be discharged until contaminant levels are within the limits. Impacts to groundwater quality would, therefore, not be expected. In addition, other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Table 4.3.3.2.1.4–1. Potential Changes to Water Resources Resulting From Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Water Source	Surface	Ground	Ground	Ground	Surface	Ground
No Action Water Requirements (million l/yr)	13,511	2,400	7,570	249	14,760	13,247
No Action Wastewater Discharge (million l/yr)	246	82	540	141	2,277	700
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	38	38	38	38	38	38
Percent increase in projected water use[a]	0.3	1.6	0.5	15.2	0.3	0.3
Water Quality						
Total wastewater discharge (million l/yr)	29.6	29.6	29.6	29.6	29.6	29.6
Percent change in wastewater discharge[b]	12	36.1	5.5	21	1.3	4.2
Percent change in streamflow	neg	NA	NA	NA	0.06[c]	0.6[d]
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	320	320	320	320	320	320
Percent increase in projected water use[e]	2.4	13.3	4.2	129	2.2	2.4
Water Quality						
Total wastewater discharge (million l/yr)	123.9	123.9	123.9	123.9	123.9	123.9
Percent change in wastewater discharge[f]	50.4	151	22.9	87.9	5.4	17.7
Percent change in streamflow	neg	NA	NA	NA	0.3[c]	2.5[d]

Table 4.3.3.2.1.4–1. Potential Changes to Water Resources Resulting From Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative—Continued

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Floodplain						
Is action in 100-year floodplain?	No	No	No	No	No	No
Is critical action in 500-year floodplain?	No	Uncertain	Uncertain	No	Uncertain	Unlikely

[a] Percent increases in water requirements during construction of the ceramic immobilization facility are calculated by dividing water requirements for the facility (38 million l/yr) with that for No Action water requirement at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[b] Percent changes in wastewater discharged during construction for the ceramic immobilization facility are calculated by dividing wastewater discharges for the facility (29.6 million l/yr) with that for No Action discharge at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

[c] Percent changes in stream flow from wastewater discharges are calculated from the average flow of Clinch River (132 m^3/s) and East Fork Poplar Creek (1.5 m^3/s). The comparison for the East Fork Poplar Creek is shown in the table.

[d] Percent changes in stream flow from wastewater discharges are calculated from the minimum flow of the Fourmile Branch (0.16 m^3/s).

[e] Percent increases in water requirements during operations of the ceramic immobilization facility are calculated by dividing water requirements for the facility (320 million l/yr) with that for No Action water requirement at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[f] Percent changes in wastewater discharged during operation of the ceramic immobilization facility are calculated by dividing wastewater discharge for the facility (123.9 million l/yr) with that for No Action discharge at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

Note: NA=not applicable; neg=negligible. Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously.

Source: HF 1995a:1; INEL 1995a:1; LLNL 1996e; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; SRS 1995a:2.

Nevada Test Site

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]) would be generated, treated, and discharged to evaporation/percolation ponds or be available for recycle. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would be discharged to the wastewater treatment system and would then be available for recycle. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater when required. This wastewater would be monitored for radioactivity, and if uncontaminated, would be available for recycling or discharge to local drainage channels.

Because there are no continuously flowing streams on NTS and no designated floodplains, there are no studies to assess the 500-year floodplain boundaries. Studies of the 100-year floodplain showed it to be confined to the Jackass Flats and Frenchman Lake areas. The site for the ceramic immobilization facility would not be located in either of these areas. However, since the NTS is in a region where most flooding occurs by locally intense thunderstorms which can create brief (less than 6 hours) flash floods, the facilities would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater. Quantities required and the percent increase in projected water use are shown in Table 4.3.3.2.1.4–1. Annual construction water requirements for the facility (38 million l/yr [10 million gal/yr]), represent approximately 0.2 percent of the estimated minimal annual recharge (38 billion l/yr [10 billion gal/yr]) to the regional aquifer under the entire NTS. As shown in Table 4.3.3.2.1.4–1, the quantity of water which would be required for construction of the facility represents approximately a 1.6-percent increase over the projected No Action groundwater usage. Operating the facilities at NTS would require 320 million l/yr (84.5 million gal/yr), which is approximately 13.3 percent of the projected groundwater usage. This additional withdrawal would represent 0.8 percent of the estimated minimal annual recharge, and would increase the total amount withdrawn annually at NTS to 7.2 percent of the estimated annual recharge. These additional withdrawals would have minimal impacts on groundwater availability.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds, however, could percolate downward into the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified. Impacts to groundwater quality are therefore not expected. Other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Idaho National Engineering Laboratory

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated, treated, and discharged to evaporation/infiltration ponds or be available as recycle. During operation, a maximum of approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would be discharged to this wastewater treatment system. All discharges would be monitored to comply with discharge limits. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to evaporation ponds or storm drains which discharge to local drainage channels.

The site for the ceramic immobilization facility is not located in an area historically prone to flooding, but is within the flood zone that could occur as a result of the failure of the MacKay Dam during a maximum probable flood. This flood event would be more critical than either the 100- or 500-year flood. Because INEL is in a region where flash floods could occur, the facility would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater from the Snake River Plain Aquifer. During construction, water requirements for the facility (38 million l/yr [10 million gal/yr]) would represent a 0.5-percent increase over the projected annual groundwater usage. This would increase the total projected amount to be pumped at INEL to 17.7 percent of the total allotment. As discussed in Section 3.4.4, a groundwater allotment not to exceed 43,000 million l/yr (11,360 million gal/yr), has been negotiated by DOE with the Idaho Department of Water Resources (DOE 1991c:4-73). During operation, the water requirements for the facilities would be 320 million l/yr (84.5 million gal/yr). This amount would represent a 4.2-percent increase over the projected annual groundwater usage and would increase the total projected amount to be pumped at INEL to 18.3 percent of the total allotment. This increase should not have any impact on groundwater availability, as INEL would be well within its total allotment.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater and would not be expected to contribute to existing near surface contamination. Treated wastewater which does not evaporate, however, could percolate downward toward the groundwater of the Snake River Plain Aquifer. This water would be monitored and would not be discharged into the treatment ponds until contaminant levels are within the limits. Impacts to groundwater quality are therefore not expected. In addition, other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Pantex Plant

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with any of the facilities; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to the existing wastewater treatment systems north of Zone 12 and then discharged to the playa lakes or would be available for recycling. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary wastewater and other wastewater would be discharged to either of these wastewater treatment systems, and then discharged to the playa lakes or would be available for recycling. The expected quantity of additional wastewater potentially discharged to the playas during operation (approximately 339,500 l/day [89,700 gal/day]) should not cumulatively cause any exceedances of the monthly average limit of 2.46 million l/day (0.65 million gal/day). This is based on Pantex's 1994 discharges, which averaged approximately 1.4 million l/day (0.37 million gal/day), and are expected to decline in the future.

Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to natural drainage channels or the playas.

The proposed location for the ceramic immobilization facility is in Zone 4. Since no 100-year, 500-year, or standard project flood boundaries have been delineated in Zone 4, there would be no impacts to floodplains. However, flooding at Pantex could occur due to the runoff associated with precipitation and ponding in local playas (LLNL 1988a:XVI).

Groundwater. All water required for construction and operation would be supplied from groundwater using the existing supply system which obtains water from the Ogallala Aquifer. Construction water requirements for the ceramic immobilization facility would be small relative to the recoverable water in aquifer storage, which for the year 2010 was estimated to be 287 trillion l (75.8 trillion gal) (PX WDB 1993a:1). As shown in Table 4.3.3.2.1.4–1, construction of the facility would require 38 million l/yr (10 million gal/yr) of water, which represents approximately a 15.2-percent increase over the projected annual No Action groundwater usage. [Text deleted.] Previous studies have shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala Aquifer, an average of 1.8-m/yr (5.9-ft/yr) decline in the water table occurred over a 10-year period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the ceramic immobilization facility at Pantex would require 320 million l/yr (84.5 million gal/yr), which represents approximately a 129-percent increase over the projected annual No Action groundwater usage and 16.9 percent of the capacity of the groundwater system. The small additional drawdown attributed to this additional withdrawal would add to the declining groundwater levels in the area thus decreasing regional availability. The total site groundwater withdrawal including this facility would be 569 million l/yr (150.3 million gal/yr) which because of expected cutbacks in other programs, would be 32 percent less than the 836 million l/yr (221 million gal/yr) currently being withdrawn from wells at Pantex.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to playas, however, could percolate downward into the groundwater of the near surface aquifer. This water would be monitored and would not be discharged to the playas until contaminant levels are within the limits specified by the TNRCC. [Text deleted.]

Although the expected drawdowns caused by withdrawing the water required for this alternative are small, the overall decline in groundwater levels in the Amarillo area is of concern. Possible groundwater conservation measures at Pantex that could be considered include decreasing research farm irrigation demands through dry farming, installing dripless faucets, and process water reuse. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use. However, details of this measure have not been determined.

Oak Ridge Reservation

Surface Water. Water required for construction and operation of the ceramic immobilization facility would be provided by the Clinch River and its tributaries. Water required during construction would be approximately 38 million l/yr (10 million gal/yr) which would represent a 0.3-percent increase over the projected annual surface water withdrawal. This additional withdrawal would be approximately 0.0009 percent of the average flow of the Clinch River. During operation, water requirements would be approximately 320 million l/yr (84.5 million gal/yr) annually. This would represent a 2.2-percent increase over the projected annual surface water withdrawal. Including this increase, ORR's total annual withdrawal would be 0.4 percent of the average flow of the Clinch River (132 m^3/s [4,647 ft^3/s]). These additional water withdrawals from the Clinch River would cause negligible impacts to surface water availability. [Text deleted.] During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (approximately 29.6 million l/yr [7.8 million gal/yr]) would be generated, treated, and discharged to the East Fork Poplar Creek and would represent a 1.3-percent increase in the amount being discharged. During operation, a total of 123.9 million l/yr (32.7 million gal/yr) of wastewater would be generated by the facility. This quantity would represent 0.3 percent of the average flow of East Fork Poplar Creek and a 5.4-percent increase in the amount of wastewater being discharged. All discharges would be monitored to comply with discharge requirements. No impacts are expected. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to storm drains which discharge to local drainage channels.

The potential location for the ceramic immobilization facility would be located outside of the 100-year floodplain. The 500-year floodplain has not been determined in this area but could be developed in future studies.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater; therefore, neither groundwater quality nor availability would be affected.

Savannah River Site

Surface Water. No surface water withdrawals would be made; groundwater would be used for all construction and operational needs of the ceramic immobilization facility. [Text deleted.] During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (approximately 29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to the sitewide wastewater treatment system which would not require any modifications. This wastewater would represent a 4.2-percent increase in the effluent from the site. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary wastewater would be discharged to this wastewater treatment system. This would represent a 17.7-percent increase in the projected effluent discharged to Fourmile Branch from this facility. This additional quantity would represent approximately 2.5 percent of Fourmile Branch's minimum flow. All discharges would be monitored to comply with discharge requirements. [Text deleted.] Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored for radioactivity, and if uncontaminated, discharged to storm drains which discharge to local drainage channels. If contaminated, this wastewater would then be transferred by pipeline or tanker to treatment facilities as required.

The potential location of the ceramic immobilization facility is outside the 100-year floodplain. Information on the location of the 500-year floodplain at SRS is currently available only for a limited number of specific project areas. However, the ceramic immobilization facility at SRS would not likely affect, or be affected by the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek because the facility would be located at an elevation of about 91 m (300 ft) above MSL and is approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these streams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about 58 m^3/s (2,040 ft^3/s). At that time the creek reached an elevation of almost 30 m (98 ft) above MSL (SR USGS 1996a:1). The elevations of the buildings in F-Area are more than 63 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately 5 m^3/s (186 ft^3/s), and an elevation of about 61 m (199 ft) above MSL (SR USGS 1996a:1). Elevations of the buildings in F-Area are more than approximately 31 m (101 ft) higher than the maximum flow level that has occurred.

Groundwater. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr) which would represent less than a 0.3-percent increase over the projected annual No Action groundwater withdrawal. This additional withdrawal should cause negligible impacts to groundwater availability. During operation, water used for cooling system makeup would be obtained from existing supply systems in the F-Area. The water for these systems is groundwater from the Cretaceous aquifer. The total annual water requirements during operations would be 320 million l/yr (84.5 million gal/yr). As shown in Table 4.3.3.2.1.4–1, this would represent a 2.4-percent increase in the projected No Action groundwater usage at SRS. These additional water withdrawals from groundwater would not impact regional groundwater levels. Previous studies using numerical simulations of groundwater withdrawals up to 6 times greater than that required for the ceramic immobilization facilities from the Cretaceous aquifer indicate drawdown of almost 2.1 m (6.9 ft) at the well head, but smaller in overlying aquifers and not beyond SRS boundaries in any aquifer (DOE 1991c:5-196). Therefore, it is expected that the withdrawals attributed to these facilities would cause a small drawdown at the well head and would not impact aquifers in the area. No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected.

[Text deleted.]